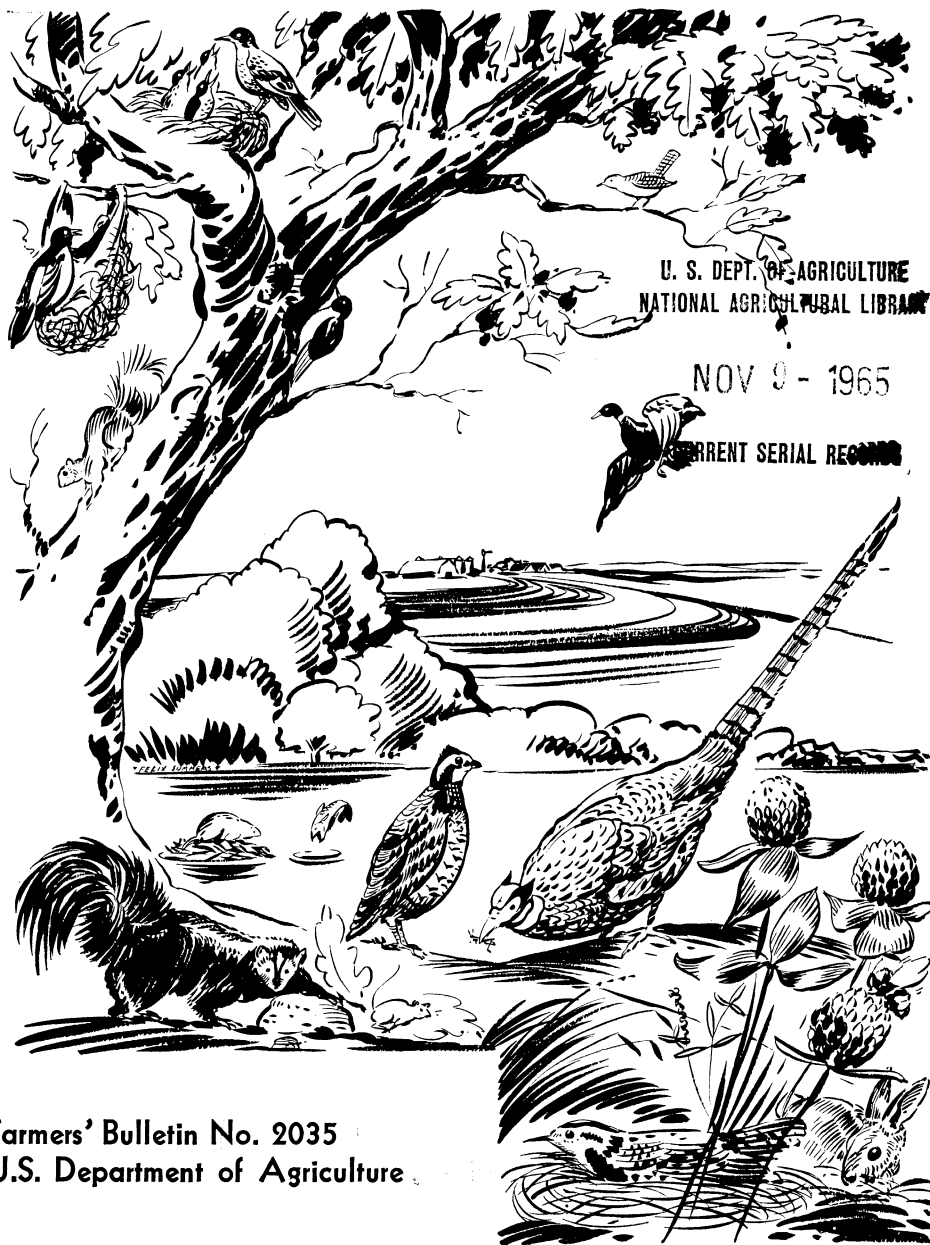


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Making Land Produce USEFUL WILDLIFE



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Farmers' Bulletin No. 2035
U.S. Department of Agriculture

YOU CAN HAVE wildlife on your land and have a better farm or ranch because of it. Every farm is a complex community which is successful only if the living things in it are working together. What you can do on your own land to maintain the most desirable biologic balance is described in this bulletin.

Our land must provide the food, fats, oils, and fibers needed for an expanding population and for securing our position in world affairs. We must produce in quantity without permanent damage to the soil. And at the same time we must look to the land for recreation and relaxation. Our farms and ranches can provide hunting, fishing, trapping, and the esthetic values inherent in a well-balanced landscape and the fish and wildlife it supports. These things can be achieved through attention to the land treatment suggested in this bulletin.

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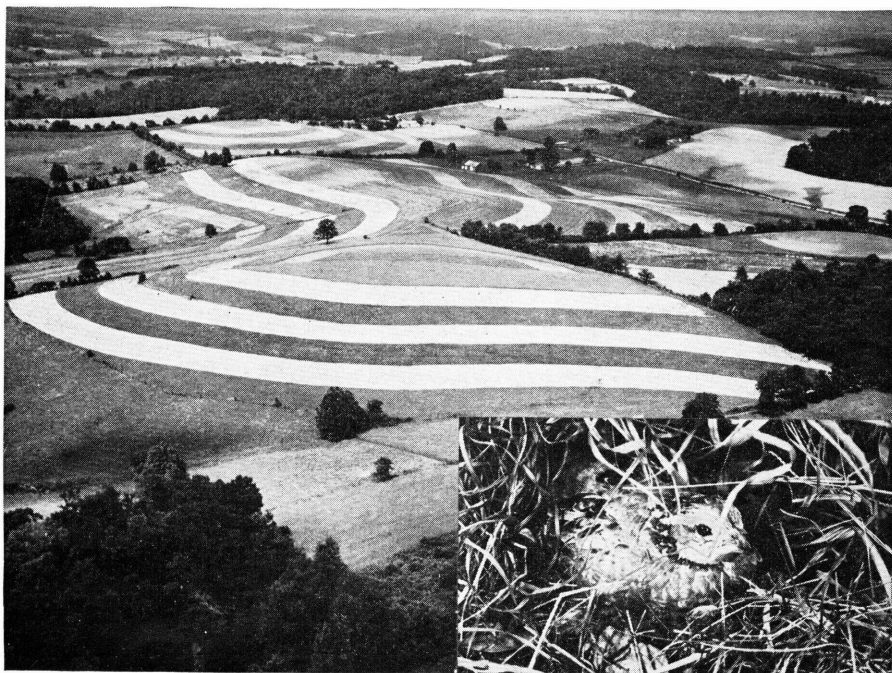
Washington, D.C.

Revised November 1960
Slightly revised September 1965

Making Land Produce Useful Wildlife

By WALLACE L. ANDERSON, *biologist, Soil Conservation Service*

Drawings by FELIX SUMMERS



EVERY FARM AND EVERY RANCH is a community of living things supported by the soil. In this community are the plants and animals that convert nutrients, moisture, and sunshine into food and fiber for man's support and into trees, grass, flowers, and wildlife for his enjoyment. It is a successful community only if the living things in it are working for the benefit of the whole community.

If there are not enough grasses in the community, most soil loses its ability to take up and hold moisture. It may become eroded and lose

some of its ability to produce corn for hogs. If there are not enough squirrels, there will be fewer acorns planted and in time there will be fewer oaks. If there are not enough cottontails—one of whose functions is to feed foxes—foxes may look to the farmer's poultry for food.



On the other hand, if there are too few foxes to eat meadow mice, there may be so many meadow mice that there will be less alfalfa for dairy cows. If there are not enough song-

birds, there may be too many destructive insects, resulting in a shortage of grain for beef cattle.



But there must be useful insects to pollinate alfalfa, red clover, and sweet-clover, else these legumes will not produce seed.

Thus we see that the community of living things on a farm or ranch has an abundance of helpful kinds of plants and animals and a low number of the harmful kinds. It has a *biologic balance* favorable to man's interests.

A system of farming or ranching that supports the family well without depleting basic resources has a favorable biologic balance. Conversely, farming or ranching that depletes the soil and results in plagues of insects, weeds, and crop diseases has an unfavorable biologic balance.

You may be surprised at the wild-life population living on well-managed farms and ranches. Studies made on Ohio farms having soil conservation plans in effect tell a convincing story. On a 100-acre farm with some woody fence rows, 15 acres in protected woods, 25 acres in pasture, and 60 acres in rotation cropland, the useful wild-life population was estimated to be:



Several million beneficial insects, mostly destroyers of other insects and some that help to pollinate fruits and legumes. *More than 400 beneficial birds*, of 40 kinds. *More than 1,000 beneficial*

small mammals, many of which are effective insect destroyers.

Also present on well-managed farms and ranches in various parts of the country are the adapted game birds and mammals—quail, pheasants, grouse, rabbits, squirrels, and, on some farms, ducks and deer—that offer sport and food for you and your friends.

Fur-bearing mammals like mink, muskrats, raccoons, skunks, and opossums provide recreation and cash income for you and your family.



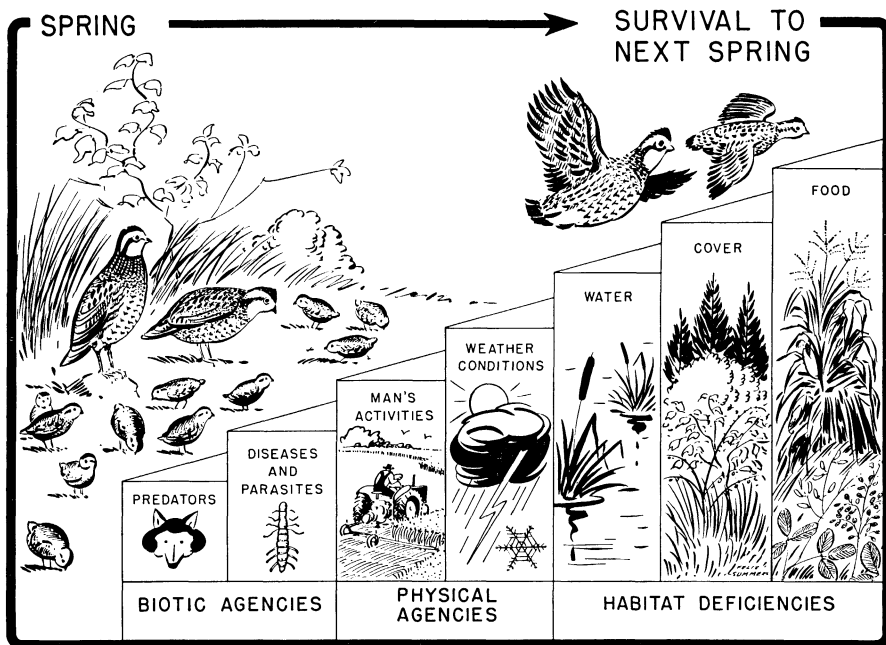
These valuable animals occur in greatest numbers on farms and ranches where the land is used wisely, because wise land use provides places for them to live.

Colorful, sprightly songbirds add much to the enjoyment of rural life through their music and activities. Who doesn't enjoy the songs of the mockingbird and the meadowlark—or the sight of robins busily feeding their young?

Bumblebees, leaf-cutting bees, syrphid flies, and other wild insects help farmers produce legume seed. The numbers of these pollinating insects can be increased through good land management.

Large-mouth bass, bluegills, channel catfish, and sometimes trout supply fun and food for families fortunate enough to have a farm or ranch pond. Many such ponds produce from 100 to 200 pounds of fresh fish per acre each year.





Factors that hold down wildlife populations are shown as hurdles over which the birds hatched in one spring must fly if they are to survive to the next spring. Only a few of these limiting factors can be controlled by man. The effects of predators may be modified, but with uncertain results. Little can be done about diseases and parasites. Some of man's activities, such as time of plowing, could be changed; others, such as time of mowing meadows, cannot very much. The greatest changes, fortunately, can be made in the most important factors. Success in managing land to produce useful wildlife lies in improving the amount, quality, and distribution of food, cover, and water.

Wildlife Requirements

While no two kinds of wildlife have exactly the same requirements for living, it is safe to say that all kinds need food, cover, and water.

To support a high wildlife population, a farm or ranch must have a plentiful supply of good food close to cover that furnishes protection from enemies and weather. And it must be available in all seasons of the year.

On many farms and ranches in the United States there is enough

food from late spring to fall—insects, wild fruits, weed seeds, waste grain, nuts, or green plants.

The critical season is winter though early spring is often just as critical. There are few insects. Many wild fruits are gone. Snow and ice may cover waste grain.

In the South, planting really good food plants close to cover is the best way to be sure you have enough wildlife food throughout the year. In the North, you can extend cover plantings close to natural sources of important foods or leave



unharvested a part of the grain crop close to good cover.



Most kinds of wildlife need several kinds of cover. Cover must conceal nests and young and provide shade from the hot sun and shelter from chilling rains. It must allow escape from enemies and it must protect against snow, sleet, cold, and wind in winter.

There are three essentials to good cover for wildlife—grasses, weeds, stubble, and other low-growing plants for nesting and roosting; dense or thorny shrubs for protec-

tion from predators, for loafing, and for nesting; and, in the North, clumps of evergreens or other tall dense cover for winter protection. All three kinds of cover should be close together and close to food.

Wildlife gets water from three sources: Surface water, food, and dew. In the East and South, upland wildlife can survive on succulent foods and dew. Surface water is a necessity for most kinds of wildlife in the arid West, as it is everywhere for water-loving species like ducks, muskrats, and mink.



Managing Land To Meet Wildlife Requirements

On most farms and ranches and on some "rurban" land, wildlife is a crop to be enjoyed by the land operator and his family and friends; it is a secondary crop from which he doesn't expect an income.

On other farms and ranches it is one of several important crops. The land operator devotes some land to wildlife; he modifies his management of fields in other crops so as to encourage wildlife.

But on some farms and ranches and on many "rurban" homesites, wildlife is the primary crop; management is aimed at producing maximum yields of fish and wildlife, usually game.

Many of the practices used on farms and ranches help wildlife, others are harmful. Some of these many practices are summarized by different kinds of land use as follows.

CROPLAND practices *helpful* to wildlife are:

1. Cropping systems that include grass-legume meadows.
2. Liming and fertilizing.
3. Stripcropping.
4. Cover crops.
5. Stubble-mulch tillage.
6. Delaying mowing of headlands, roadsides, and watercourses until after the nesting season.
7. Leaving unharvested $\frac{1}{8}$ to $\frac{1}{4}$ acre of grain next to good cover.

Cropland practices *harmful* to wildlife include clean fall plowing; mowing of watercourses and head-

lands before ground-nesting birds have hatched; and burning of ditchbanks, fence rows, and crop residues.



PASTURELAND practices *helpful* to wildlife are:

1. Grazing within the carrying capacity of the pasture.
2. Liming and fertilizing.
3. Reseeding, renovating, or overseeding with legumes.
4. Building ponds for livestock water.

Pastureland practices *harmful* to wildlife are uncontrolled burning, overgrazing, and complete clean mowing early in the season.



RANGELAND practices *helpful* to wildlife include:

1. Proper grazing and salting.
2. Watering places for livestock.
3. Reseeding.
4. Construction of walkways in marshy range.
5. Partial brush removal.



Rangeland practices *harmful* to wildlife are overgrazing and complete brush removal.

WOODLAND practices *helpful* to wildlife include:

1. Protection from unwanted fire and harmful grazing.
2. Selective cutting in small woodlands.
3. Leaving den trees when cutting hardwood timber.
4. Piling brush near the edge of the woods.
5. "Release" cuttings to increase production of acorns, nuts, and other tree seeds useful for wildlife food.
6. Cutting trees out of woodland

borders to increase the growth of shrubs for food and cover.

7. Clear-cutting when harvesting aspen and western conifers.
8. Seeding clovers and grasses along roads and trails and in woodland openings.

Woodland practices *harmful* to wildlife are uncontrolled burning and grazing and cutting of all den trees.



WILDLIFE LAND includes any land managed especially to produce desired kinds of fish and wildlife. Many of the helpful practices listed above under other land uses are also applicable to wildlife land.

Special practices include:

1. Controlled burning.
2. Food-patch planting.
3. Mowing or using herbicides to keep woody plants out of areas that should stay in low-growing grasses, legumes, and other herbaceous plants.
4. Seeding grasses and legumes.
5. Planting trees and shrubs, especially in prairie areas.
6. Managing water—this includes construction of earth fills, installation of water-level control structures, and, in the arid parts of the country, establishing wildlife watering places.



There are eight kinds of areas on farms and ranches that can be managed especially for wildlife. These areas can be called *wildlife land*. Recommendations for their treatment follow.

Wetlands

Many farms throughout the United States have wet areas that can be improved to produce ducks, muskrats, mink, and other kinds of wildlife that live near water. Some of these wet areas, particularly marshes and small potholes in the northern half of the United States, are already valuable producers of wild ducks and other waterfowl. Large areas of coastal marsh in the East and South are important wintering grounds for ducks and geese.

Generally, you should manage marshes either for fur-bearing mammals or for waterfowl. If managed for one they will be somewhat useful for the other, but you cannot have best conditions for both on the same area. For either purpose, three requirements must be met: (1) A dependable water supply, (2) water-level control facilities, and (3) the right kinds and amount of vegetation for feeding, nesting, and resting.

For small marshes, the simplest management is careful control of grazing and burning.

Too much grazing destroys valuable food and cover. Some marshes should be protected from all grazing until after choice duck-food plants have matured. Burning can be important in marsh management, but only when done correctly. You will want to get technical advice on when, where, and how to burn your marsh.

Many wetlands are so overgrown with marsh plants that there are no areas of open water. Such wetlands can be greatly improved for ducks by removing vegetation in

strips 30 to 50 feet wide. Methods of removing undesired vegetation include spraying with herbicides and the use of dynamite or a dragline. Temporary clearings can be made by mowing when the marsh is dry or by blading on the ice.

The importance of loafing spots to waterfowl is generally not fully appreciated. Small islands, knolls, sandbars, open margins, or exposed mudflats are valuable for this purpose. Firmly anchored floating logs or rafts are used by ducks as loafing, sunning, sleeping, and preening spots. Rock piles and old bales of hay or straw in the shallower parts of a marsh will serve the same purpose.

Marshes in duck-nesting areas should have 6 or more inches of water for at least 3 months in spring and early summer. If yours does not, you can improve it for ducks and other waterfowl by digging or blasting one or more holes about 30 feet in diameter and 2 to 3 feet deep.



VT-808

Managed marshes produce good profits from moderate investments.



MINN-1743

Openings in the marsh, when provided with loafing spots, will attract ducks.

If you have a marsh larger than 5 acres that has a reliable water supply from a stream, a spring, or a reservoir you may be able to improve it by controlling the water level. You will need engineering help to find out if a water-level-control structure can be built at a feasible cost.

To manage a northern marsh for muskrats by controlling the water levels, you will want to maintain water levels at about 6 inches during the summer to encourage the growth of muskrat foods. Then raise the water level to about 2 feet in the fall and hold it there over winter to prevent the marsh from freezing to the bottom. If not already present you may wish to plant cattail, burreed, arrowhead, or bulrush to make the marsh productive as quickly as possible.

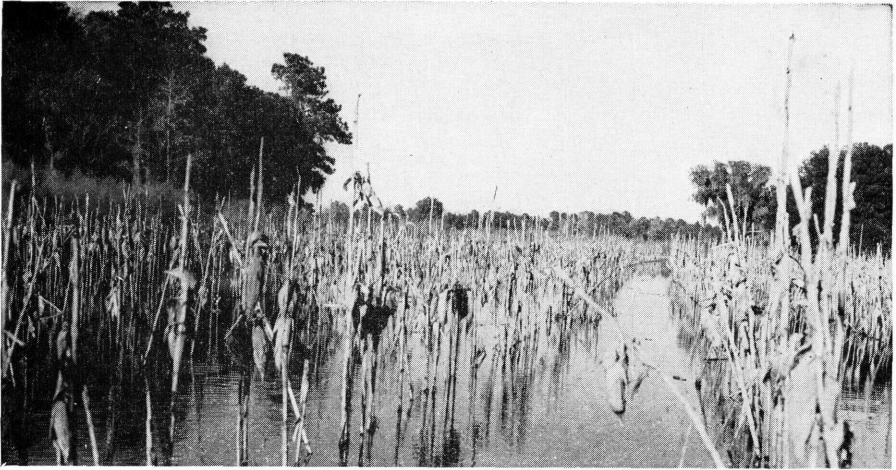
To manage a marsh for waterfowl by controlling the water levels, you have two choices. One method is to draw the water down enough to keep the soil moist—but with no water on the surface—during the growing season. This will favor growth of smartweed, burreed, wild

millet, and other good waterfowl-food plants.

In the fall the area should be flooded to a depth of 1 to 15 inches to make it attractive to ducks. This method produces the most duck food but it does not provide nesting for waterfowl or homes for muskrats.

The other method is to maintain the water level at depths between 15 and 30 inches throughout the season, holding it at 15 inches in the fall. This method will favor the growth of waterfowl-food plants such as wild celery, sago and other pondweeds, arrowhead, naiads, duckweed, and stonewort. These are fair to good duck foods and some of them are used by muskrats too.

If you have a marsh larger than 5 acres that does not have reliable surface water but that does have a water table that keeps water within 1 foot of the surface, you may be able to improve it for ducks, mink, and muskrats with level ditches. You will need help from your local soil conservationist to find out if your marsh has soil suitable for



SC-D18-20

Wide-row corn and browntopmillet have been flooded in this duck field.

ditching and to determine the best arrangement for the ditches.

Many farms and ranches have fields that can be planted to choice duck foods, cultivated, and later flooded so the ducks can readily eat these foods. Such fields are much more attractive to ducks than fields of the same crops grown on dry land that cannot be flooded.

The best foods to grow in duck fields are corn, browntopmillet, smartweed, barnyardgrass, Japanese millet, and buckwheat. For duck use, these crops must be flooded to depths of 1 to 15 inches with water previously stored in a nearby pond, reservoir, or flood-control structure. Water might also come from a stream, irrigation canal, bayou, or well. It can be brought to your duck field by gravity flow or by pumping. In most parts of the country, except coastal Oregon and Washington, you can't depend on runoff water from fall rains for this flooding.

For a good duck field, you must

be able to control the water. For spring or summer cultivation you will need some way to drain off the water. During fall and winter a control structure to regulate the water depth is necessary. Ask your local soil conservationist for help in selecting sites and planning needed structures or other devices.

Coastal marshes require special consideration because of the possibility of changing the salinity of the water and its effects on vegetation. Be sure to get help from a soil conservationist before attempting ditches or controlled water levels on coastal land.

If you live in the South and are interested in attracting wild ducks to your farm, see Farmers' Bulletin 2144, *Managing Farm Fields, Wetlands, and Waters for Wild Ducks in the South*. This bulletin gives detailed information on the kind of food-producing duck fields, marshes, and ponds you can have on your farm and tells how to manage them.

Ditchbanks

Water is usually present in drainage and irrigation ditches during the spring and summer. Wildlife food is often available in nearby crop fields. Cover added in the form of grasses and legumes makes ditchbanks ideal places for wildlife to live. It also protects the ditch and prolongs its usefulness.

Fur bearers, game birds and mammals, and insect-eating songbirds will all benefit from good management of ditchbanks.

Ditches filled with willows, cottonwoods, or other trees and shrubs are not able to carry the flow of water they were designed to handle. They provide poor drainage for land that might otherwise produce good crops.

Your first aim in good ditchbank management should be to establish and keep grass on the banks. Use grasses that offer real competition to the woody plants that would otherwise invade the ditch and lower its water-carrying capacity.

This treatment also makes clean-out and maintenance easy.

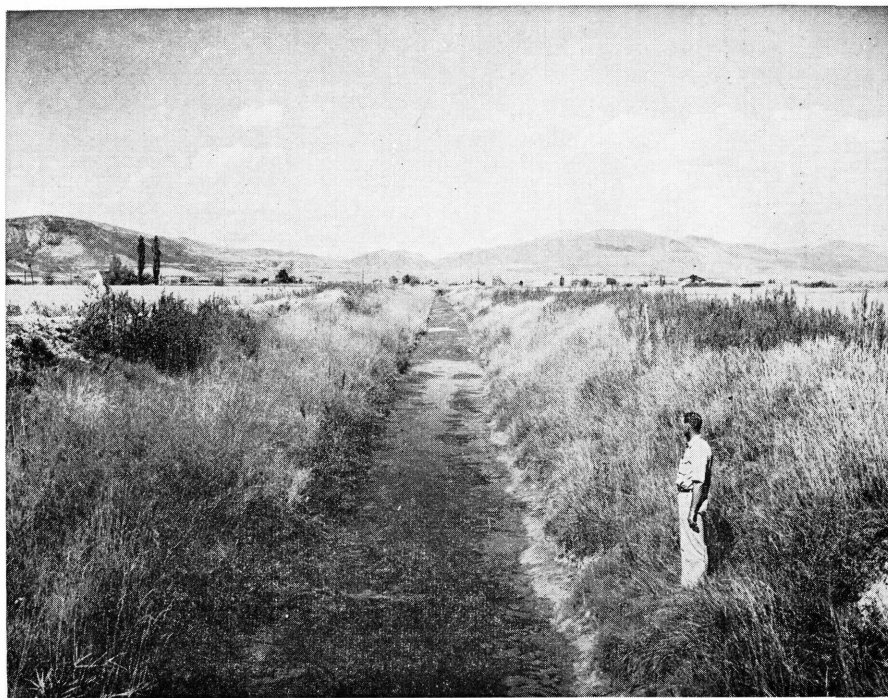
Seeding grasses on the subsoil of steep ditchbanks is often difficult. Your local soil conservationist or county agent can advise you on soil treatments, kinds of grasses to seed, and seeding methods. He can also tell you what legumes to mix with the grass.

In many places strong winds may blow soil from adjoining tilled fields. This soil is dropped in the



IA-1386

Drainage ditches filled with trees and shrubs may be good for wildlife, but they cannot provide good drainage for adjacent fields.



UTAH-1461

Drainage ditches kept in grasses and legumes provide effective drainage for nearby fields and also produce wildlife.

bottom of ditches, sometimes adding many inches of silt in a single year.

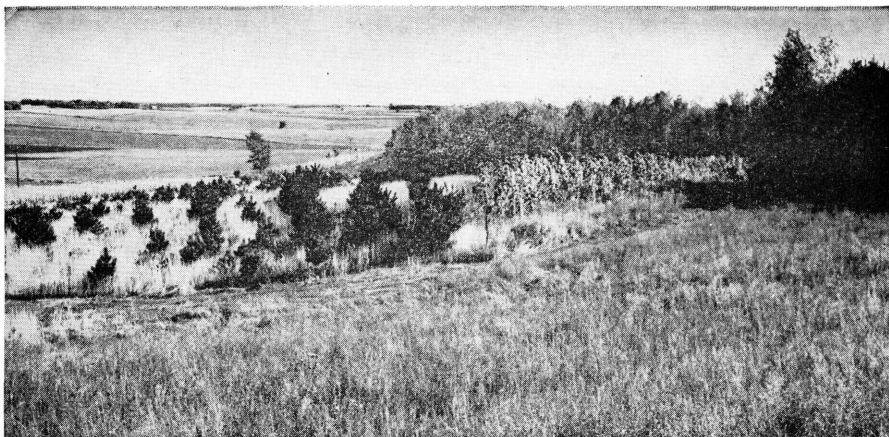
If you have this problem, you should plant a one- or two-row shrub windbreak. Plant it about 100 feet from the ditch and on either or both sides of it. You can crop the land between the ditch and the windbreak in the same rotation as the rest of the field.

Shrubs suitable for windbreaks include bush honeysuckle, Persian lilac, autumn olive, multiflora rose, and Amur and California privets in the East; caragana, chokecherry, Russian-olive, and squawbush pyro-cantha in the West. On peat and muck soils spirea has been successful.

You can keep ditchbanks and berms in grasses and legumes by mowing once a year if the slopes are flat enough, by restricted grazing, or by the use of herbicides.

Do your mowing only after ground-nesting birds have left the nest, usually about grain-harvest time. Avoid overgrazing—it is important to maintain a good grass cover to prevent erosion and siltation of the ditch. Avoid burning—it seldom helps the grasses and often encourages weeds.

Keep woody plants *out*; keep good grasses *in*; plant windbreaks where needed; be careful to do mowing or grazing only in late summer; avoid burning—this is good management both for ditchbanks and wildlife.



MINN-1744

Grass, corn, conifers, and shrubs close together make an ideal "odd area."

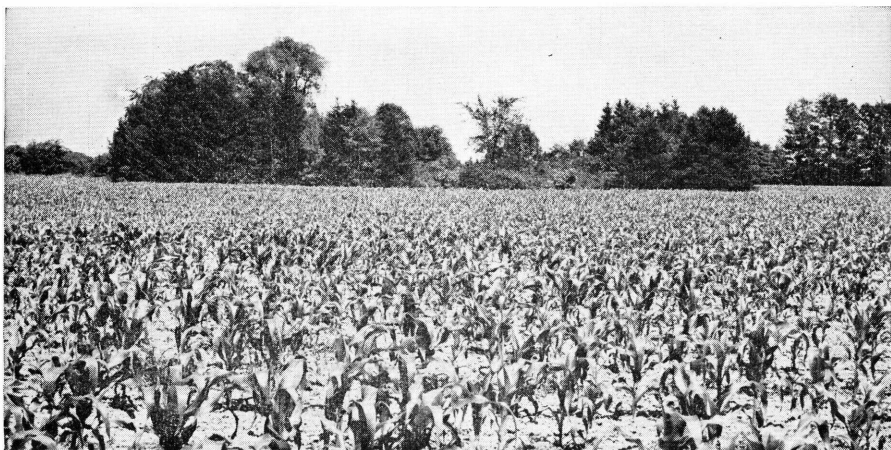
Odd areas

Parcels of "waste" land that can be changed into wildlife land are called odd areas. They include eroded areas in crop fields, bare knobs, sinkholes, sand blowouts, large gullies, abandoned roads and railroad rights-of-way, borrow pits, gravel pits, and pieces of good land that are cut off from the rest of

a field by a stream, drainage ditch, or gully.

Some odd areas already have the kinds of plants that produce good wildlife food and cover—they need little or no improvement except protection from fire and grazing. Others may provide nesting cover but no winter cover.

If the odd area you want to improve has no food or cover plants,



MICH-60,974

When surrounded by cropland, "odd areas" need provide only cover.



MINN-1740

Wildlife planting on a sandy, rocky area that had been in a pasture. Corn left unharvested in the cropped field furnishes winter food.

you will need to add them. In the North, you might well start by planting a winter cover of adapted conifers in the center of the area. Plant 25 to 50 in a solid clump. Space them about 8 feet apart so they will retain their lower limbs and keep good cover close to the ground as long as possible. In the South, where snow is infrequent and temperatures seldom stay below freezing very long, the conifers for winter cover are not needed.

Next, you can supply nesting cover and some food for songbirds by surrounding the conifers with one to three rows of fruit-producing shrubs. These might include multiflora rose, autumn olive, and blackberry, all of which are thorny and make good escape cover too.

Multiflora rose would provide emergency food for pheasants. Highbush cranberry, Russian-olive, autumn olive, gray and silky dogwoods, bush honeysuckle, bayberry, chokecherry, and wild plum are all fruit producers that would supply some food in fall and would be

useful for nesting songbirds.

Be sure to leave *at least* half of your odd area in good ground cover of grasses and legumes. Good ground cover is needed by cottontails, pheasants, and other ground-nesting birds.

If you want to increase bobwhites and if you live south of Highway 40 and east of the Great Plains you may want to include $\frac{1}{8}$ acre or more of shrub lespedeza.

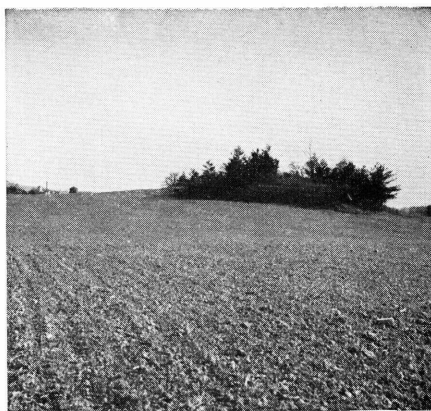
Plant your shrubs 3 to 4 feet apart to get a good thicket. Plant shrub lespedezas in rows 3 feet apart with the plants 2 feet apart in the row.

Working out from the shrubs, you will want to have at least one-half of the area in nesting cover for bobwhites and other ground-nesting birds. If native grasses are sparse, you can sow a mixture of grasses and legumes. Korean, Kobe, and common lespedezas are topnotch bobwhite foods. Don't try to get too heavy a stand—nesting birds like to be able to see what is coming their way. If your soil is acid you will need to apply lime

before seeding legumes. Ask your local soil conservationist for help in choosing species to seed and in determining your soil's need for lime and fertilizer.

To keep livestock out of your odd area, you can add a living fence of multiflora rose or other thorny shrub. If you live where living fences do not grow well, you will need a wire fence—the kind will depend on the type of stock.

If you live in the pheasant-producing area west of the Mississippi and want to increase pheasants, you may want to make your odd-area planting in the form of a windbreak. Plant two rows of such hardy shrubs as wild plum, sand cherry, Russian-olive, or bush honeysuckle on the west and north sides. Then sow a strip 100 feet wide to sweetclover and plant a block of at least 100 conifers or hardwood trees like green ash, soft maple, or boxelder in the southwest corner. This type of planting should be at least 1 acre in size to



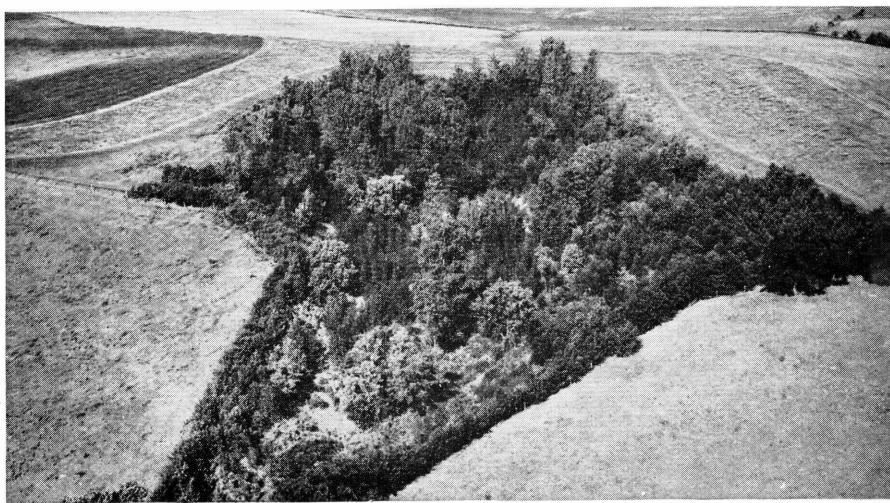
VT-785

"Odd area" on a rock outcrop in a cultivated field.

provide the winter shelter and the nesting cover needed in that area.

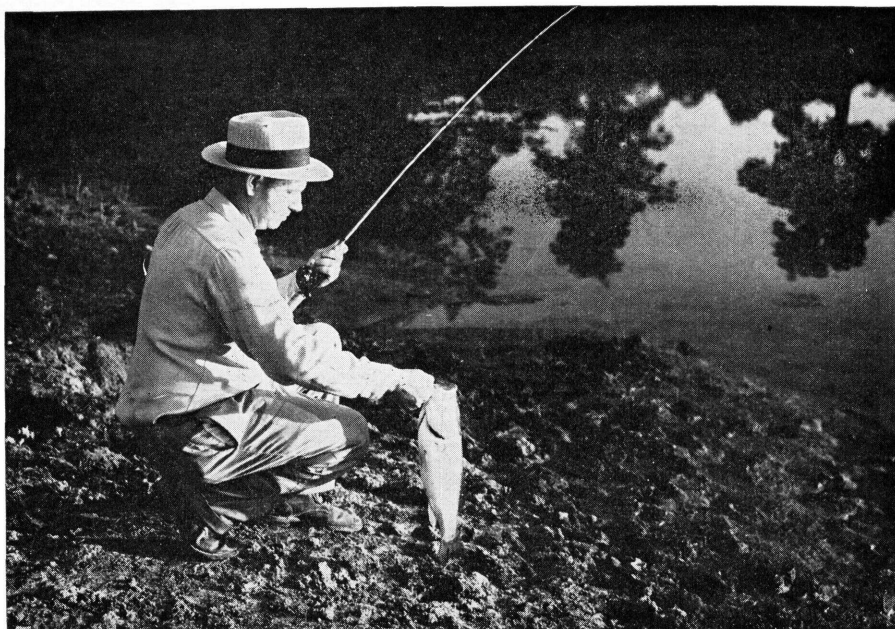
If you live east of the Great Plains, you can often depend on nature to provide native shrubs in odd areas that are protected from fire and grazing. That means you may need to plant only multiflora rose or a grass-legume mixture.

Plan to spray or mow half of the grassy area every other year to keep woody plants out of it.



MINN-1696

"Odd area" that was once a large gully.



KY-666

Ponds

Ponds are constructed for one or more purposes:

1. Soil erosion and flood control.
2. Water storage for livestock, irrigation, orchard spraying, or fire protection for farm buildings.
3. Fish production.
4. Drinking water for deer, wild turkeys, and other wildlife.
5. Resting, feeding, and breeding places for ducks.

Ponds must be located on relatively tight subsoils or they must be sealed with clay; otherwise, they will not hold water. They are often built in gullies or small valleys with steep sides and gradually sloping floors so they will hold the desired amount of water without excessive height in the fill. Other ponds are built by excavating and diking the site. Ponds should be placed where they will contribute to sound land use on the rest of the farm and

where they will be free from excessive siltation.

The water supply for most ponds comes from water running off the land. The size of the watershed needed varies according to local rainfall, topography, type of cover, and rate of evaporation. The entire watershed should be in ungrazed woods or improved permanent pasture or range. Cropland in the watershed shortens the life of the pond by allowing too much silt to get into it. Springs, wells, streams, and irrigation canals are often suitable sources of water supply, but ponds should not be constructed across running streams. Streams carry too much water and silt, and it is difficult to keep stream fish out of the pond.

Ask your local soil conservationist for advice on building your pond. You will profit from his local experience and knowledge.

On most farms and ranches, the pond should be fenced to keep out livestock. This is important to help prevent the spread of livestock diseases; to protect the fill, spillway, and pond banks from trampling; and to provide a filter strip of grass to remove silt from the water before it reaches the pond. Fencing will also allow you to make plantings for upland wildlife, if needed.

In many areas, multiflora rose or other thorny shrubs may be used to establish a fence or hedge as shown in the drawing. Also you may want to plant a few clumps of conifers or shrubs. Use the same species and spacings suggested on page 11.

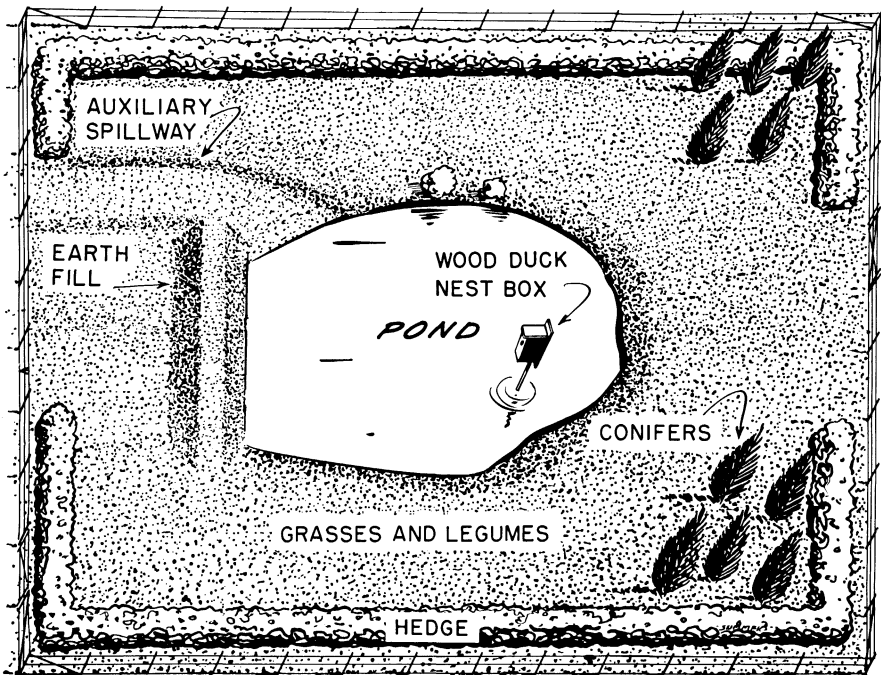
All raw areas above the waterline should be seeded to adapted grasses and shallow-rooted legumes like alsike clover, red clover, or Korean

or common lespedeza. Never plant trees, shrubs, or deep-rooted legumes like alfalfa, sweetclover, or sericea lespedeza on the fill. Use lime, fertilizer, and manure as needed.

If you want to manage your pond for fish production, don't plant anything in the water. Keep woody plants back at least 25 feet from the water's edge to allow plenty of room for fishing.

If you don't care about fish but want to attract ducks and muskrats to your pond, you can add a loafing place (see page 7) in shallow water and allow a few cattails, arrowhead, bulrushes, or burreeds to come in naturally. In shallow water they may become so thick that they will need to be controlled from time to time.

For fish production your pond needs to be at least $\frac{1}{2}$ acre in surface area.



In the North, ponds should average 10 feet in depth and should have $\frac{1}{4}$ of the pond 12 to 14 feet deep. In the Central States, ponds should average 6 feet in depth with $\frac{1}{4}$ of the area 8 to 10 feet deep. In the South, they should be at least 4 feet deep in the deepest part.

Ponds for fish production should be built so they are 3 feet deep within 10 feet of the shoreline.



This helps control waterweeds and mosquitoes and permits bass to reduce the number of small fish.

Large-mouth black bass, bluegills, and red-eared sunfish make a very good combination for warm-water ponds. But no one of them is satisfactory alone. Bluegills and red-ears, stocked alone, quickly overpopulate the pond with stunted fish. Bass, stocked alone, do not get enough food to grow rapidly. They must feed on other fish for maximum production. In the North these fish are not quite as satisfactory as they are elsewhere.

Fish stocking rates vary greatly from State to State; you should stock at the rate recommended by your State fish and game agency, the Fish and Wildlife Service, or your soil conservation technician.



Channel catfish may be stocked alone or they may be stocked in addition to the bass, bluegills, and red-ears. Channel catfish seldom spawn in farm ponds unless special spawning devices are provided so

they must be restocked occasionally.

Fish such as crappies, bullheads, and green sunfish generally are not satisfactory either alone or in combinations.

In ponds where the summer water temperature will not exceed 70° F., brook or rainbow trout may be stocked at the rate of 300 to 600 fingerling fish per surface acre. No other fish should be stocked in trout ponds. Trout do not ordinarily reproduce in ponds; usually they must be restocked every other year. Brook trout may reproduce in ponds that have springs flowing through sand or gravel.

Fingerling fish for stocking your pond can be obtained from commercial hatcheries or from hatcheries of the U.S.

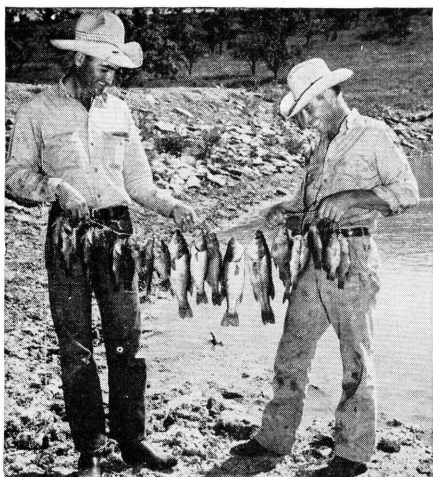


Fish and Wildlife Service and some State conservation agencies.

Most farm ponds are not fished heavily enough. Fishing should begin as soon as both bass and sunfish have spawned, but not before. Bass usually reproduce during the first summer in the South but most likely during the second summer in the North. You can easily check the reproduction in your pond with a minnow seine.

Fish for bass lightly for the first 2 or 3 months. This is about the only time you can fish your pond too hard. Thereafter, heavier fishing will not upset the balance between bass and bluegills.

It is not good management to throw back any fish caught on hook and line except undersized bass.



TEX-41,630

There is real fun in fishing.

Bluegills should never be returned to the water, regardless of size.

Neither is it good management to fish selectively for bass. Generally, three-fourths of your total pounds of fish are bluegills. A good rule of thumb would be to harvest 3 to 4 pounds of bluegills for every pound of bass. Good bass fishing is a reward for heavy bluegill fishing.

Start fishing for trout 8 to 12 months after stocking. They should be 7 to 9 inches long. Trout should be completely fished out by the end of the second year. Then restock your pond.

You can catch bluegills most easily on a small hook (size 8 to 12), baited with crickets, grasshoppers, earthworms, white grubs, catalpa worms, or a small piece of shrimp. Let the baited hook settle to the bottom of the pond, then pull it back slowly, moving the bait about an inch at a time. Bluegills bite best in summer and fall.

The best place to fish for bluegills is on the spawning beds, which you can see in clear water or can locate by fishing in cloudy, highly fertile water.

Bass are best caught with minnows or artificial bait. A "popping bug" on a flyline will give you a thrill when a bass takes it. Plugs or spinners used with a casting rod are excellent. Spinning lures are easy to use and provide plenty of excitement when a bass is hooked. Bass fishing is best in spring and fall; it may be poor in summer.

Artificial flies (size 10 to 14) with light tackle will readily catch trout and bluegills and provide the ultimate in fishing enjoyment. Trout are easily caught with worms, flies, or spinning lures.

You will often have to try several kinds of bait to find out what is most attractive to the fish at any particular time.

In States where they may be used legally, fish traps and seines will help you harvest the fish crop that should be taken.



TENN-D3-8

Fishponds need frequent fishing.

Fertilizing farm ponds is usually necessary for maximum fish production in the South. In the North results vary; it may be worth trying if fish production in your pond is too low, or if you need to control underwater weeds.

A highly fertile pond will support more pounds of fish than one of low fertility. Experiments in the Southeast show that unfertilized ponds in that area support less than 100 pounds of fish per acre, average ponds support 150 pounds, highly fertile ponds support 400 pounds.

Fertile water shades out submerged weeds. It is greenish and opaque, because innumerable tiny plants are present. Sunlight does not go any deeper into such water than you can see. Weeds cannot grow without light. Although some people may object, it is perfectly safe to swim in the colored fertile water.



TEX-49,668

Check your pond's fertility this way.

Fertilizing costs money. It will pay you dividends only if you fish the pond heavily or if you need to control waterweeds.

Fertilizing must be done systematically. Once begun, it must be continued because the fish in the pond quickly put on weight when fertilizing is started. If fertilizing is stopped the amount of fish food is sharply reduced, then the fish must lose weight in order to live on the smaller amount of food available.

If you plan to use fertilizer, you should apply it at 1- to 2-week intervals beginning early in the spring. Continue to apply it until the water becomes so cloudy that you can't see a bright object 12 inches below the surface. Continue to check the cloudiness of the water at weekly intervals. Additional applications of fertilizer should be made whenever the water begins to clear.

You need nitrogen and phosphorus in about equal parts. Potash may not be needed in areas where this nutrient is plentiful in the soil. Desirable formulas are 8-8-2 and 8-8-4. Each application of fertilizer should consist of 100 to 200 pounds per surface acre. Completely soluble fertilizers are available in such formulas as 20-20-5 and 16-20-0. These fertilizers should be applied at a rate of about 40 pounds per surface acre. If you cannot buy the fertilizers recommended above, you can buy nitrogen and phosphate separately. They need not be mixed before application. Your soil conservationist, county agent, or fertilizer dealer can advise you.



ND-594

Shallow ponds attract waterfowl.

The water in muddy ponds can be cleared by applying 200 pounds of cottonseed meal and 200 pounds of superphosphate per acre. Agricultural gypsum applied at the rate of 525 pounds per acre-foot of water is equally effective.

Acid ponds may be cleared of silt by applying 50 pounds of slaked lime for each acre-foot of water.

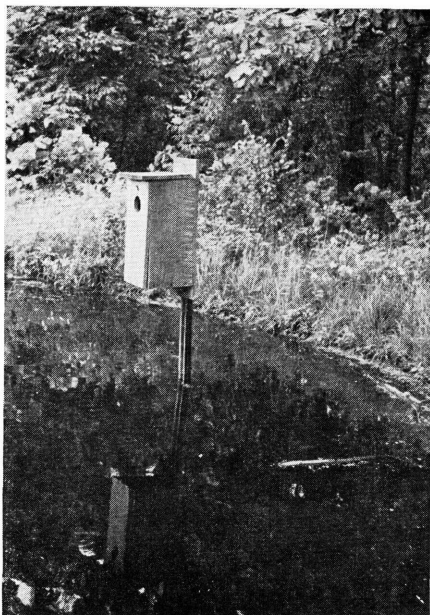
When the pond water has cleared and the source of silt has been treated to prevent further siltation, you can start using inorganic fertilizer again.

Controlling weeds in ponds is necessary for good fish production and ease of fishing. Fertilizing is the most practical way to control underwater weeds. Some waterweeds will have to be treated chemically to control them. If you have this problem, ask your local soil conservationist or one of the fishery biologists of your State wildlife agency for advice. Plants growing

around the shore are best removed simply by pulling them out as fast as they get started. Two or three hours a month spent at this task will provide satisfactory control.

Winterkilling of fish in northern ponds may occur when snow accumulates on top of the ice. The only practical recommendations for its control are to remove the snow from part of the pond surface or to lower the water a few inches below the ice to admit air.

Farm ponds can furnish a lot of pleasure—swimming, boating, fishing, hunting, and, in the North, skating. But they will do so only if they are well planned, well constructed, and well managed. Farmers' Bulletin 2210, *Warm Water Ponds For Fishing*, will give you more information on pond management.



OH-45,700

Nest boxes help attract wood ducks.



R2-155

The early settlers built rail fences.



MO-1833

Midwestern farmers planted hedges.



Wis-777

Some farmers made fences of stone.



NY-20,281

Northern settlers used pine stumps.

Fence rows and hedges

Fences have taken several different forms at different times and in different parts of the United States. Pioneers in wooded areas put their excess timber to work in the form of rail fences. When the mid-western prairies were being settled, something else had to be found—timber was scarce there. Osage-orange hedges were the ingenious solution in many places. In some areas, farmers disposed of unwanted stones and stumps by using them to build fences.

All of these kinds of fences were helpful to wildlife because they provided cover of one kind or another close to the farmer's fields where food could be found.

Then came the invention of the barbed- and the woven-wire fences, easier to construct than any of their predecessors and less wasteful of valuable cropland. Soon the wire fence was used almost everywhere, *but*, unless the landowner allowed native shrubs to grow in it, it furnished no cover for wildlife.

Now, a new kind of fence is gaining popularity. It is the living fence of close-growing shrubs. Where it is used it is a real boon to wildlife.

At the same time many old ideas about the necessity for maintaining "clean" fences in order to control insect pests or weeds are going out the window. Modern studies of wildlife relationships are showing that shrubby fence rows have many advantages for the farmer.

Shrubby fence rows have been shown to harbor fewer harmful and

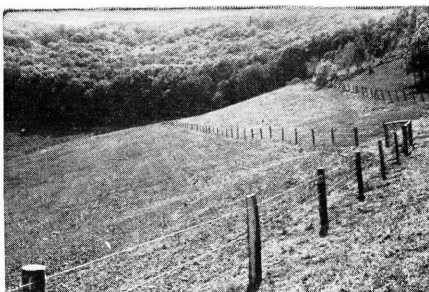
many more beneficial kinds of wildlife than do grassy fence rows, on most farms and ranches.

Hedges and shrubby fence rows fit best where fence lines will not be changed, as between cropland and pasture, along property boundaries and streams, or around large gullies, ponds, and odd areas. Hedges are being used more and more as contour guidelines between crop fields and on terraces and diversion dikes.

Multiflora rose is an outstanding shrub for use in fence rows and hedges wherever it can be grown. It is capable of forming a living fence that requires no wire, needs no hard-to-maintain braces to follow contour lines, and does not require trimming or pruning. It is fast growing and attractive, makes good wildlife cover, and produces wildlife food. Because it sometimes spreads into pastures and abandoned farmland, multiflora rose is unacceptable to some landowners.

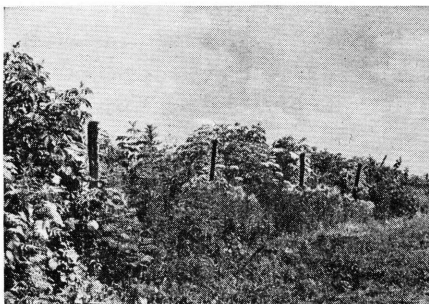
Where multiflora rose cannot be grown or is not wanted, one of the following shrubs will produce good hedge or fence-row cover: Red cedar, gray dogwood, American hazelnut, elder, silky cornel, highbush cranberry, bush honeysuckle, Russian-olive, pyrocantha, chokecherry, trifoliolate orange, buffaloberry, squawbush, or autumn olive. Ask your local soil conservationist for suggestions.

Autumn olive is an outstanding producer of food for birds. As a hedge, it makes a screen that shuts out an unpleasant view and discourages trespassers. For more information on where to grow autumn olive and on its many uses, see U.S. Department of Agriculture Leaflet



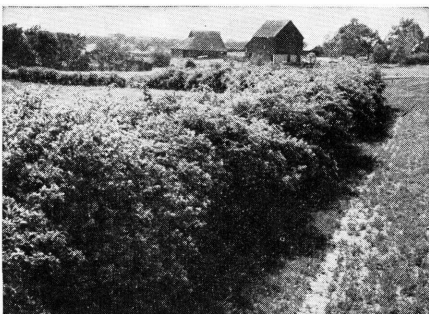
Wis-1361

Wire fences offer no wildlife cover.



OH-30,450

Native shrubs improve wire fences.



IA-1930

Living fences need no wire or posts.



PA-966

Contour hedges save soil and game.

458, Autumn Olive for Wildlife and Other Conservation Uses.

These shrubs will not sap soil moisture to reduce yields of adjacent crops; neither will they shade crops appreciably.

When planting living fences of multiflora rose or hedges of other shrubs it is important to start right with thorough ground preparation. Mark the location with stakes, then plow a backfurrow, making two rounds with a two-bottom plow. Smooth with a harrow.

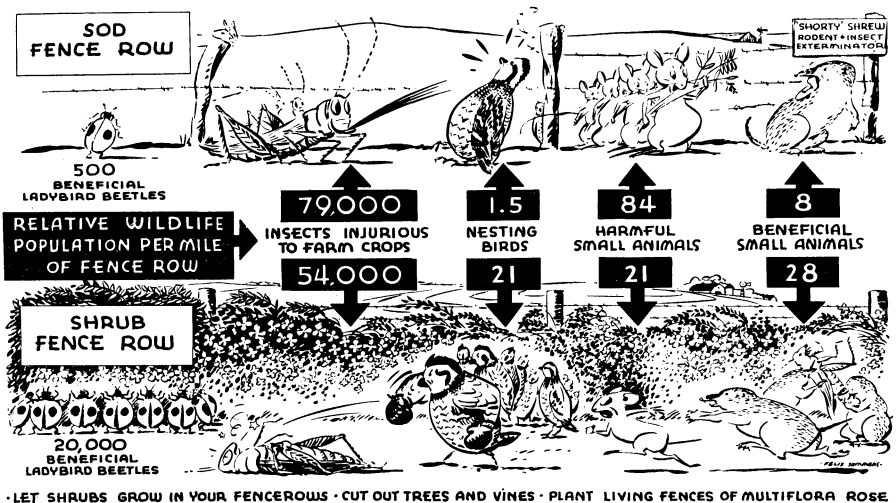
In the North, plant multiflora rose in the spring. Open a new furrow on the ridge of the backfurrow and set the plants in the new furrow. Hold them in place with a handful of soil. Then plow another furrow to cover the roots. Pack soil around the roots with the tractor wheel.

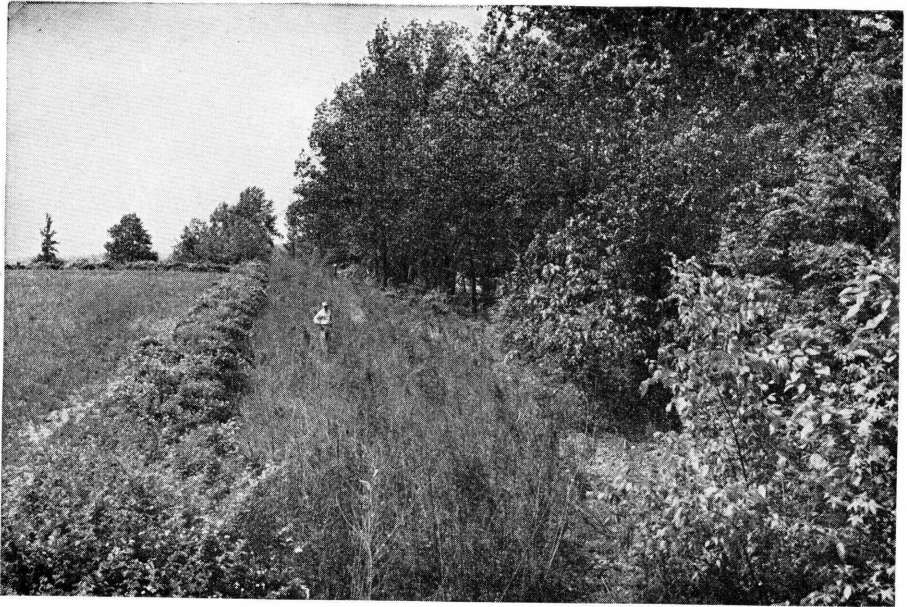
In the South, fall or winter planting is better. Method of planting is the same as for the North.

You can speed the growth of your hedge by plowing down 1 pound of complete fertilizer, such as 5-10-5, for every 40 feet of row. Shrubs also respond well to mulching. Use strawy manure, plain straw, old stack bottoms, sawdust, wood chips, or stalks. If you have no mulching materials, cultivation the first 2 years is essential. If your hedge runs up and down hill, you should be sure to use mulch instead of cultivation. Otherwise you are likely to have excessive erosion.

If you don't want to grow shrubs in your fence rows, you can improve them for wildlife with sericea lespedeza or sweetclover. Simply throw a furrow to the fence row in the fall. In late winter or early spring broadcast $\frac{1}{2}$ pound of sericea (see page 24 for range) or $\frac{1}{4}$ pound of sweetclover per 100 feet of fence row.

Existing fence rows of shrubs, trees, and vines can be made neat in appearance by cutting out the trees. This also reduces competition with crops.





MINN-1692

Wildlife borders

Wildlife borders are used to control erosion and to make use of narrow strips of land in which satisfactory grain crops are hard to grow. They are also used in places where perennial plants are needed for special purposes.

In different parts of the United States, wildlife borders are established in one or more of the following situations: As turnrows along the edges of cropland fields; in sapped areas such as those where cropland is next to woodland or windbreaks; along streams or ditches; around waterways, wet spots, or gullies; along farm roads; above diversion dikes; and for confinement strips to keep Bermuda grass from spreading into cropland fields.

There are really two types of wildlife borders: Those made up of grasses and legumes and those of shrubs or shrubs and conifers.

Legume-grass borders make farming easier by giving a headland on which to turn farm machinery.

Shrub or shrub-conifer borders protect woodland from drying winds and prevent the loss of leaf mulch. This conserves moisture and helps the trees grow faster.

Both types of wildlife borders benefit useful wildlife by providing either food or cover—sometimes both. The cover they furnish is next to cropland where food is sometimes available and the food they produce is often next to woodland where there is cover.

Wildlife borders help you produce more insect-eating songbirds, more game birds and mammals, and more pollinating insects on your farm.

You can establish legume-grass borders most easily when you are seeding the entire field to meadow. You can use any combination of locally adapted grasses and legumes.

When you plow up your meadow for clean-tilled or grain crops, leave a border about 1 rod wide unplowed. You can leave it unplowed indefinitely as long as a good sod remains. When the sod is no longer satisfactory, you can plow and reseed the border the next time you seed the field to meadow.

Since legume-grass borders occupy such small acreages and since undisturbed nesting cover is one of the greatest needs of ground-nesting birds and rabbits, it is suggested that you leave them unmowed. If weeds must be controlled, delay mowing until after grain harvest if at all possible. By that time most young birds will be out of the nest.

If you live east of the Great Plains and south of U.S. Highway 40 in the Midwest or U.S. 30 in

the East you can establish bicolor or japonica lespedeza borders around your woods. These lespedezas are excellent bobwhite foods. A strip of shrubby lespedeza of at least $\frac{1}{8}$ acre, preferably $\frac{1}{4}$ acre, is a good supplement to the other foods in the range of a covey of quail.

Bicolor lespedeza is a perennial legume—you won't have to plant or seed it more than once. If you want more information about this valuable plant, see USDA Leaflet 373, *Lespedezas for Quail and Good Land Use*.

In many parts of the Southeast and as far north as southern Iowa, southern Michigan, and southern Pennsylvania, you can establish good wildlife borders around woodlands by seeding sericea lespedeza. Used alone, it is not as valuable for quail food as bicolor. Used in com-



Wis-1341

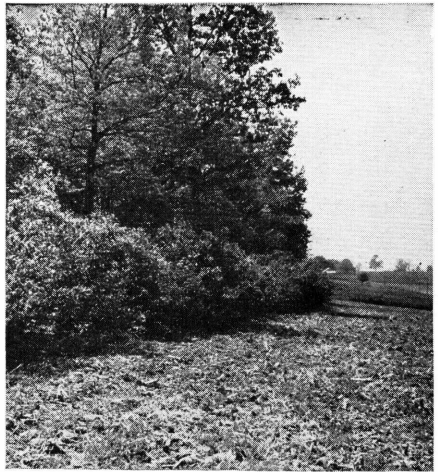
Legume-grass field borders control erosion and produce useful wildlife.

bination with bicolor, it provides a turnrow and makes excellent cover. It is a good cover for quail, rabbits, and many other kinds of wildlife. Like bicolor, it is a perennial legume that needs to be sown only once.

To establish sericea lespedeza, prepare a good seedbed, broadcast scarified seed at the rate of 20 to 30 pounds per acre, and then cultipack. Sericea lespedeza frequently makes a slow start. What appears to be a seeding failure may make an excellent stand if left undisturbed until the second or third year. You can speed growth by applying 400 to 800 pounds of 0-10-20 fertilizer per acre at the time of seeding.

Many landowners wish to protect woodlands from grazing by using living fences of multiflora rose. Since the rose does not grow well in shade, you should plant it at least 20 feet away from the edge of the woods. The strip in between should be planted to bicolor lespedeza, sericea lespedeza, or one of the shrubs listed below. These plants will provide competition for tree seedlings that might otherwise get started in this strip. They will delay the day when the woods will reach out to overtop the living fence. If you don't make such a planting it may be necessary for you to "brush out" this strip from time to time to keep your living fence effective against livestock.

If you live north of the area where the lespedezas are adapted, you can get good wildlife borders by using cut-back borders along your woods. This can be done by cutting all trees in a 30-foot strip bordering on cropland, pasture, or roads through the woodland. The



PA-40,524

A cut-back wildlife border.

new shoots from the stumps make good deer browse. By opening up this area, native shrubs receive enough light to make good growth. They will produce food and brushy cover for rabbits, quail, ruffed grouse, and many other kinds of wildlife.

If this is not practical, you can have good wildlife borders by planting shrubs like bush honeysuckle, gray or silky dogwood, American hazelnut, autumn olive, wild plum, thornapple, nannyberry, or highbush cranberry.

For a good border, plant four rows 4 feet apart in the row. Plant the taller shrubs (wild plum, autumn olive, thornapple, nannyberry, and highbush cranberry) next to the woods. Put the lower growing species (honeysuckle, dogwood, and hazelnut) in the two outer rows. In the North, jack, red, Scotch, or white pine or Norway spruce may replace the taller shrubs, thus helping to provide needed winter cover.

Windbreaks

Field windbreaks are planted in crop fields to help control wind erosion and lessen the drying effect of wind on the soil. They conserve snow moisture needed in low rainfall and light soil areas.

Because of the large amount of "edge" in relation to acreage, field windbreaks are especially valuable in providing wildlife cover. They create homes for insect-eating birds close to cropland, where they can do the most good. They provide cover and travel lanes for game.

Farmstead windbreaks are planted around farm buildings to protect them from winter wind and snow. They are much used by wildlife and are very important to pheasants in winter.

Two kinds of field windbreaks are used in various parts of the United States. In the prairie areas

shrub-hardwood windbreaks are common; in formerly forested areas pine windbreaks are used.

Both kinds are usually planted at right angles to the prevailing wind.

To prepare the ground for planting, you should plow and harrow it in the fall, and then harrow again in the spring. In the Great Plains, you should summer-fallow a year ahead of planting.

Shrub-hardwood windbreaks usually consist of from 4 to 12 rows. In 4-row windbreaks, the outer 2 rows are shrubs or conifers and the inner 2 are hardwood trees. Windbreaks containing 8 or more rows should have shrubs or conifers in the outer 4 rows.

Single-row windbreaks in which trees and shrubs alternate in the row are being used on high-value land.

You can choose from any of these shrubs: Bush honeysuckle, Amur or



ND-576

Shrub-hardwood windbreaks save soil, moisture, and wildlife in the West.



MINN-1701

Conifer windbreaks are favorite nesting places for mourning doves.

California privet, autumn olive, and multiflora rose in the East; Russian-olive, wild plum, chokecherry, honeysuckle, desert willow, buffalo berry, pyrocantha, and squawbush in the West. Juniper is commonly used for an outside row.

Hardwood trees you can use, depending on your locality, include American elm, boxelder, green ash, soft maple, black locust, Chinese elm, mulberry, catalpa, apricot, cottonwood, and willow. Arizona cypress, athel, and eucalyptus are commonly used in single or multiple-row windbreaks in the Southwest.

Plant shrubs about 4 feet apart in the row with the rows 8 to 10 feet apart. Hardwoods are planted 8 to 10 feet apart in the row with rows 8 to 16 feet apart. Use the wider spacing with wide-spreading trees like cottonwood and for all species in low rainfall areas.

Conifer windbreaks consist of three or more rows, using Austrian, jack, Monterey red, Scotch, short-leaf, white, or yellow pines; Norway, blue, or white spruce; white cedar; or Douglas-fir in rows 8 to 10 feet apart. Space the trees 6 to 8 feet apart in the row. Shrubs may be used to flank the trees as in the hardwood type.

You should protect all windbreaks from fire and grazing at all times. They should be cultivated regularly the first 2 years in the East and for at least 5 years in the West.

You can use the same species and spacings for farmstead windbreaks as for field windbreaks. Farmstead windbreaks are usually placed on the north and west sides of the farmstead. Be sure to keep them at least 100 feet away from the buildings to keep snow from drifting into the farmyard.

Streambanks

Streambanks are treated to control bank cutting, protect valuable adjoining property, and reduce the silt load in streams. Such streambank protection is one of the best ways to improve wildlife conditions because it usually provides food, cover, and water close together.



It also improves the stream for fish. It benefits furbearers, game birds and mammals, and songbirds.

It is always desirable to treat the entire length of a stream at one time. If that can't be done, try to work from the headwaters on down.

Before you start treatment of any streambank, you should consider several things. These include size of the watershed draining into the stream, expected runoff and flood peaks, expected ice and debris load to be carried by the stream, and causes of meandering and erosion.

The most common causes of streambank erosion are: Overgrazing, fallen trees that deflect water from its normal direction of flow, and trees or brush growing on the inside of a curve that deflect water against the cutting bank. Streambank erosion may also be caused by water from a smaller stream entering a channel and depositing sediment that pushes the water against the bank.

The first, and often the most difficult, thing to do in treating a streambank is to protect the stream from grazing. If stock water is needed, you can provide watering

places where livestock will not have to cross a steep bank. You may wish to provide more than one watering place. You can then use them alternately to prevent stock from killing all the vegetation.

Next, correct the causes for meandering. Remove fallen trees and trees and brush on inside curves. Eliminate the sediment carried by small streams through conservation practices on their watersheds or by desilting dams in their channels.

For small streams up to 6 feet wide with low banks 3 to 4 feet high and watersheds of not more than 2 square miles, protection from grazing is often all that is needed.

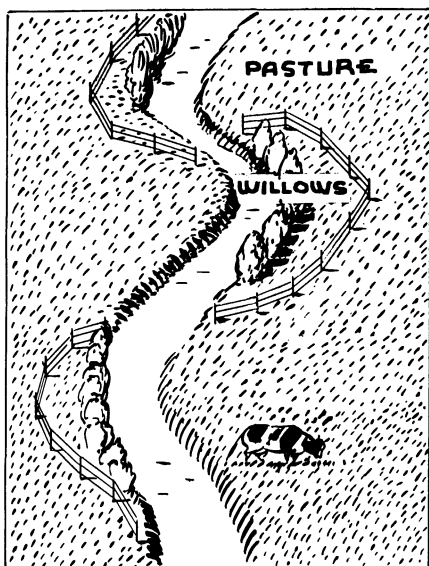
On large streams, be sure to get engineering assistance to locate and construct brush and rock-wing dams, pile-wing dams, timber cribs, or tree revetments. Wherever you install such structures you should plant willow cuttings or tall grasses between them to provide the permanent protection that only living plants can assure.



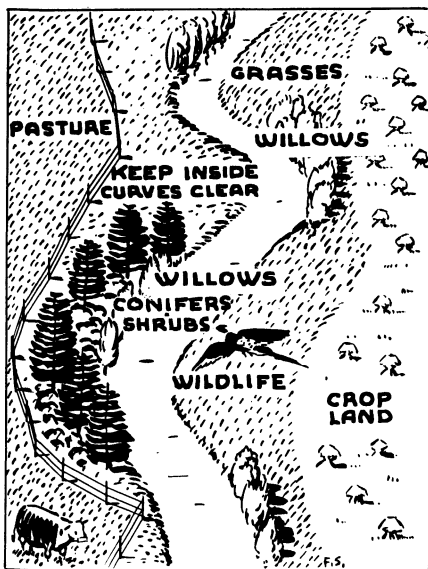
On all types of streambank improvement, much of the value of wildlife comes from planting of moisture-tolerant

shrubs and trees between the bank and the fences of adjacent fields.

Shrubs that you can use in such places include red-osier dogwood, silky cornel, Russian-olive, nannyberry, and highbush cranberry. Multiflora rose living fences may be planted as a permanent fence along the top of the streambank.



How to protect streams having deep water and high banks.



How to protect streams having shallow water and low banks.

White pine, yellow pine, Northern white cedar, Rocky Mountain juniper, and Norway spruce are conifers you can plant for winter cover.

All types of streambank control that include willows require maintenance. You will get better protection if you cut the willows periodically to keep the stems small and pliant so they will bend over and "shingle" the streambank during periods of high water. Willows and other trees growing on the bank proper should always be cut out as soon as they become 2 inches in diameter.

Debris lodged against the banks during floods should be removed as soon as the water returns to normal flow. It is particularly important to keep brush cut down on inside curves. If you do this

job once a year, it need not become burdensome.

Sediment in streams is very destructive to fish. It covers spawning beds and valuable food organisms. It causes mechanical injury to the gills of fish. Sediment is the product of erosion on the watershed of the stream.

The measures described here can only control erosion on the streambank itself. Before they can do the job they are capable of doing to improve fishing on your stream, erosion on the entire watershed must be satisfactorily controlled.

Ask your local soil conservationist to help you develop a complete erosion-control plan for your farm. Only in that way can you get full value from your streambank work.



